Fisheries and Oceans Science | Pêches et Océans Sciences

CSAS
Canadian Science Advisory Secretariat

SCCS
Secrétariat Canadien de Consultation Scientifique

Proceedings Series 2001/18

Série des compte rendus 2001/18

Proceedings of the Fourth Meeting of the Transboundary Resources Assessment Committee (TRAC)

17 – 20 April 2001

Conference Centre
St. Andrew's Biological Station
St. Andrew's, New Brunswick
Canada

R. O'Boyle
Meeting Chair

Fisheries and Oceans Canada
Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, Nova Scotia
Canada B2Y 4A2

July 2001

Canada

102-00697/

Proceedings of the Fourth Meeting of the Transboundary Resources Assessment Committee (TRAC)

17 – 20 April 2001

Conference Centre
St. Andrew's Biological Station
St. Andrew's, New Brunswick
Canada

R. O'Boyle
Meeting Chair

Fisheries and Oceans Canada
Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, Nova Scotia
Canada B2Y 4A2

July 2001

FOREWORD

These Proceedings are a record of the TRAC meeting which was held during 17 – 20 April 2001. The report records as faithfully as possible the contributions and discussion that transpired at the meeting. However, the individual interpretations and opinions expressed at the meeting are not necessarily or in all cases scientifically sustainable or supported by other participants. The discussion summaries document the deliberations, which led to the tabled proposals. No statements are to be taken as reflecting the consensus of the meeting unless they are clearly identified as such. Moreover, additional information and further review may result in a change of decision where tentative agreement has been reached.

AVANT – PROPOS

Le présent compte rendu relate les travaux de la réunion du Comité d'évaluation des ressources transfrontalières (CERT) tenue du 17 au 20 avril 2001. Il reflète aussi fidèlement que possible les contributions et discussions des participants à la réunion. Toutefois, les opinions et interprétations individuelles qui y sont présentées ne sont pas nécessairement ou toujours soutenables sur le plan scientifique, ou appuyées par les autres participants. Le résumé des discussions documente les délibérations ayant abouti aux propositions déposées. Aucune déclaration ne doit être considérée comme une expression du consensus des participants, sauf s'il est clairement indiqué qu'elle l'est effectivement. En outre, des renseignements supplémentaires et un plus ample examen peuvent avoir pour effet de modifier une décision qui avait fait l'objet d'un accord préliminaire.

TABLE OF CONTENTS

Abstract / Résumé 4

Introduction 5

Update on the Ocean Climate of Georges Bank 6

Presentation of the Transboundary Assessment Working Group (TAWG) Report 8

Eastern Georges Bank (5Zjm) Cod 9

Georges Bank (5Z) Cod 14

Eastern Georges Bank (5Zjm) Haddock 16

Georges Bank (5Z) Haddock 18

Georges Bank (5Zjmnh) Yellowtail 20

Reference Points 24

Appendices 26
- Appendix 1. List of Participants 26
- Appendix 2. Letter of Invitation 27
- Appendix 3. Meeting Remit 28
- Appendix 4. Meeting Schedule 29
- Appendix 5. List of Documents Tabled 30
- Appendix 6. List of Recommendations 31
- Appendix 7. Minutes of Yarmouth 28 March 2001 Canadian Industry Consultations 34
- Appendix 8. Report of the TAWG 37

ABSTRACT

The fourth meeting of the Transboundary Resources Assessment Committee (TRAC) was held during 17 – 20 April 2001 in St. Andrew's, New Brunswick, Canada and provided a forum for joint Canada/USA peer review of assessments for Georges Bank cod, haddock, and yellowtail flounder resources. For Canada, these discussions produced Stock Status Reports for use in management for the 2001 fishing year. For the USA, the meeting produced advisory reports, which will be considered for developing harvest advice for the 2002 fishing year. The methodology necessary to calculate reference points was also discussed. Recommendations were made to improve future assessments.

RÉSUMÉ

La quatrième réunion du Comité d'évaluation des ressources transfrontalières (CERT) s'est tenue du 17 au 20 avril 2001 à St. Andrews (Nouveau-Brunswick), Canada. Elle a permis au Canada et aux États-Unis de procéder ensemble à un examen par les pairs des évaluations des stocks de morue, d'aiglefin et de limande à queue jaune du banc Georges. En ce qui concerne le Canada, les discussions ont débouché sur des Rapports sur l'état des stocks, qui serviront à la gestion de l'année de pêche 2001. Pour ce qui est des États-Unis, la réunion a permis de produire des rapports consultatifs, qui seront utilisés pour formuler des avis sur la récolte de l'année de pêche 2002. On aussi discuté de la méthodologie de calcul des points de référence. Des recommandations visant à améliorer les évaluations futures ont été présentées.

INTRODUCTION

The chair, R. O'Boyle, opened the meeting by greeting the participants (Appendix 1) and inviting them to introduce themselves. The meeting letter of invitation is presented in Appendix 2.

The chair then briefly noted that this was the fourth TRAC meeting, the first one being in April 1998. The 1998 meeting was an extensive review of the Canadian and US cod, haddock and yellowtail management units. Since then, the meeting location has alternated between Canada and the US. In 2000, the TRAC meeting was held in Woods Hole during 26 – 28 April. He noted that a description of the TRAC process was in the proceedings of the April 1998 meeting and he wouldn't describe it here. It was mentioned that the Transboundary Assessments Working Group (TAWG) had met in Woods Hole during 16 – 18 March 2001 to compile the working papers to address the TRAC remit (Appendix 3). It was pointed out that the assessments were updates of those considered in 2000. This meeting was to review the TAWG produced assessments, as per the meeting schedule (Appendix 4). As well, the TAWG had conducted some work (although not as much as planned) on the calculation of biological reference points. There would be discussion at this meeting on this. Finally, it had been planned to discuss future changes to the TRAC review process, but this was not possible due to the tight schedule.

For Canada, the products of this meeting would be Stock Status Reports to be presented to the Fisheries Resources Conservation Council (FRCC) on 7 May 2001, in time for its report to be provided to the DFO minister on 23 May. Until these reports had been presented and made public, participants were told to consider the discussion of the meeting confidential.

R. O'Boyle outlined how the meeting would be conducted. For the Proceedings, a rapporteur was assigned for each stock. The senior author of each working paper would present the results of the analyses, during which questions of clarification only would be addressed. Following this, the external reviewers would be asked to provide comment, after which the floor would be opened to general discussion. These reviewers had been sent the TAWG working papers, prior to the meeting. The external reviewers were R. Mohn, S. Smith, and M. Schirripa.

The list of documents tabled is given in Appendix 5 and the list of recommendations from the meeting in Appendix 6. In addition, the proceedings of a pre-TRAC industry consultation meeting held by DFO St. Andrew's staff is given in Appendix 7.

After points of clarification, the meeting commenced.

UPDATE ON THE OCEAN CLIMATE OF GEORGES BANK

Working Paper: Page, F.H., R. Losier, K. Drinkwater, B. Petrie, G. Harrison, and D. Sameoto. 2001. Overview of Physical and Biological Oceanographic Conditions on Georges Bank. TRAC Working Paper 2001/07.

Rapporteur: R. Losier

Remit:

- Provide an overview of ocean climate conditions on Georges Bank during 2000, in comparison to the historical record.

Presentation Highlights

Data concerning the physical and biological indicators for Georges Bank were drawn from information presented at the March 2001 annual meeting of the Canadian Department of Fisheries and Oceans Fisheries Oceanography Committee (FOC). Archived temperature data for Georges Basin, Georges Shoal, and eastern Georges Bank indicates that the waters were above normal temperature in recent years by about 1°C. Sea surface temperatures derived from bi-weekly composites of satellite images also suggest this. A vertical stratification index (defined as the difference in water density between the surface and 50 meters) indicates that stratification on Georges Bank, in Georges Basin and in the Northeast Channel has remained relatively constant over the past several 20 years.

The Shelf-Slope front, as defined by the near-surface thermal boundary between the shelf and offshore slope waters, was closer to shore in the year 2000 than normal. This was also the case for the position of the northern boundary of the Gulf Stream.

Phytoplankton biomass, as indicated by satellite-derived bi-weekly estimates of chlorophyll concentrations, was higher in the year 2000 than in 1999 or 1998. The annual maximum in chlorophyll concentration on Georges Bank occurs in late March.

Zooplankton biomass, as indicated by the abundance of *Calanus finmarchicus* in the Continuous Plankton Recorder (CPR) data, has decreased since the late 1980s.

An overview of the Canadian research vessel (R.V) groundfish surveys conducted on Georges Bank shows a reduction in hydrographic sampling effort since 1992, with most of the remaining effort concentrated on the Canadian side. Although the timing of the surveys has varied by about one month since the beginning of the survey series in 1987, the timing has been reasonably consistent in recent years. Near-bottom temperatures observed during the surveys range from 3 to 8°C for the shallow bank strata (5Z2-5Z7). Temperatures in the deeper strata (5Z1 and 5Z8) range from about 3 to 14°C. Temperatures observed during the 2000 and 2001 surveys were warmer than the survey strata means and medians by about 1°C. The salinity in 2001 was also higher than normal. The cumulative frequency distributions of

temperature and salinity revealed that these relatively warm and salty conditions were due to a lack of low temperature and low salinity water. The five-year running mean stratified mean temperatures have been increasing since 1987 and the stratified mean salinity decreasing, although it appears to have increased during the more recent years (2000 and 2001). The overall conclusions were:

- Water temperatures have been about 1°C higher than normal on Georges Bank in recent years. However, they are still within the normal range for Cod and Haddock.
- The degree of vertical stratification on Georges Bank has been relatively constant for the past 20 years.
- Chlorophyll concentrations were higher in 2000 than in 1999 and 1998.
- There has been a decreasing trend in *Calanus finmarchicus* abundance since the late 1980s.

Discussion

A number of questions were asked and replies provided.

Does the North Atlantic Oscillation (NAO) correlate with environmental conditions on Georges Bank? The NAO index might show weak correlation. There is a suggestion, from work done by Dave Mountain that it correlates with plankton volumes.

Does high salinity effect larvae abundance? The salinity variations needed to directly influence larvae are often about 10 psu. The variability in salinity on Georges Bank is usually less than this. The variability indicated in some plots of the salinity data is due primarily to variability in sampling depth rather than true temporal variability. Salinity variability may influence water column stability or it may indicate differences in nutrient levels entering the Gulf of Maine system. Both of these can potentially influence lower trophic level production processes.

Why use *Calanus finmarchicus* as a biological indicator for zooplankton. The species was selected only as an example to show the TRAC committee the potential of CPR data. The species tends to be well distributed but not necessarily the dominant species.

Recommendations

- A paragraph describing the trends in temperature, salinity, stratification, chlorophyll, and zooplankton should be added to all the Stock Status Reports and Advisory Reports produced by the meeting (this was done).

PRESENTATION OF THE TRANSBOUNDARY ASSESSMENT WORKING GROUP (TAWG) REPORT

Rapporteur: L. O'Brien

Discussion

Due to variability in age at length of larger yellowtail flounder and the potential spatial difference in age at length, 'borrowing' age keys from the NMFS survey to apply to DFO survey and Canadian length frequency samples becomes problematic. The use of iterative methods to derive age composition had also been rejected by the TAWG. The TRAC agreed that a benchmark assessment for yellowtail flounder would best be conducted after the age interpretation program for yellowtail flounder has been initiated by DFO.

The TRAC supports the continued suggestion to conduct an ageing workshop between NEFSC and DFO age readers to monitor percent agreement for ageing of cod and haddock.

Reference points derived from different models based on different assumptions, e.g. an age-structured model and surplus production model, are not directly comparable. The TRAC agreed that the biological reference points utilized to determine stock status should be derived from the same model employed to estimate population biomass and conduct short-term forecasts to avoid mixing of reference points estimated by different models.

The TRAC emphasized that 10-year projections are best utilized for exploration of alternative harvest strategies and that the utility of using long term projections for setting management goals is less certain. Analyses reported in the literature have shown that probability statements about medium term forecasts do not represent the actual probabilities of eventual outcomes and, therefore, are not considered appropriate for establishing annual management measures.

Recommendations

- The next benchmark assessment for yellowtail flounder be conducted after the yellowtail flounder ageing program by DFO has been established, the results verified and used to age the Canadian data.

EASTERN GEORGES BANK (5Zjm) COD

Working Paper: Hunt, J.J., and B. Hatt. 2001. Population Status of Eastern Georges Bank Cod (Unit Areas 5Zjm) for 1978 – 2001. TRAC Working Paper 2001/04.

Rapporteur: Dan Lane

Remit:

- Report on the status of the stocks, updating results for the latest information from fisheries and research surveys and characterize the uncertainty of estimates
- For a range of yield quotas in 2001, evaluate the consequences on exploitation rate in 2001 and on spawning stock biomass (or its proxy) in 2002.
- Estimate the probability that the 2001 fishing mortality rate would exceed $F_{0.1}$ and that the spawning stock biomass in 2002 would not achieve a 0%, 10% and 20% increase compared to 2001, for a range of yield quotas in 2001.
- Report on progress against research recommendations made at the 2000 TRAC.

The 5Zj,m stock assessment was presented by Joe Hunt. The comments below summarize the main points of the discussion that followed the presentation.

The Fishery

Total removals of cod in 5Zjm in 2000 of 2238t declined from the 1999 total of 2968t. The Canadian fishery caught its allocation of 1600t down from 1800t in 1999 due primarily to lower proportional catch by fixed gear; the US catch in 2000 by mobile gears of 662t was just over one-half of the 1999 catch of 1150t. Again in 2001, industry members from the Canadian fixed gear fleet reported to TRAC that due to restrictive management measures on cod in the mixed cod-haddock fishery, historical fishing patterns for cod on Georges Bank have changed. In particular, longline fishermen continue to adapt their fishing practices to avoid cod by not fishing in traditional areas where cod are reported to be found without difficulty. In 2000, longliners fished for haddock first (in order to build-up catches of this species in proportion with recent allocations) before then fishing for cod that was available in the traditional areas. The mobile gear fleet is better able to direct for haddock in the mixed fishery with cod as by-catch. The geographical distribution of catches and location of fishing effort in 2000 was similar to the past two years.

In the 2000 fishery, as in 1999, the distribution of observed versus predicted 5Zj,m cod landings at age revealed a predominance of the 1996 year-class (age 4 cod in 2000). The predicted proportion of older fish (ages 5+), thought to be fully recruited to the fishery, were overestimated compared to the observed proportion landed for the third year running (since the 1998 fishery). Discussion on this point also focused on the possibility that older cod, perhaps due to changes in fish behaviour, or changes in fishing practices, or both, may not be fully available to fishing gear. Similarly, younger fish (ages 3 and 4) showed increased catchability. These observations were further substantiated by fitting the VPA to alternative

terminal year F assumptions and generally raised questions about the appropriateness of the flat-topped partial recruitment function for this stock. The open-ended TRAC discussion on this topic was evidence that continued study on the partial recruitment of the 5Zj,m cod stock is warranted with potential changes in terminal year F calculations for the assessment in 2002.

The 2001 TRAC noted that US management regulations including 2000 lbs. of cod trip limits, and 20,000 lbs. weekly landings limit together did not aggravate the potential for discarding in the 5Zj,m cod fishery.

Resource Status

As recommended in the previous three TRACs (1998 and 1999 and 2000), the necessity for an ageing workshop was again restated in 2001. However, no specific plans for the proposed workshop were discussed.

One large tow of 2t in the spring (February) DFO survey in 2001 was reported. Without this tow, the 2001 survey would be the lowest on record. As for the large tow in 2000, it was decided not to discount the 2001 survey estimate, but to leave it in 'as is' in the assessment dataset. The handling of the anomalous 1982 NMFS Spring survey point was similar in approach, and this data point has been retained in subsequent analyses despite the high residuals it produces.

Analysis of age of maturity in Canadian sampling of the 2001 DFO spring (February) survey reported that nearly all (95%) 2 year old cod sampled in 5Zj,m were mature. This eclipsed the trend since the late 1990s of increasing proportions of mature 2 year olds in this stock. In the discussion, it was uncertain as to what interpretation this information might be conveying about cod stock status. It was agreed that further investigation and review would be necessary to understand: (1) the validity of the observation, and (2) impact of this on stock status. Other stock status measures (e.g., an at-age condition such as comparative annual fish 'plumpness' or distribution of length and weight for selected ages) were suggested to corroborate the maturity observations.

The catchability of young fish by the research vessel surveys was discussed in light of retrospective patterns that showed that these cohorts tended to be underestimated as young of the year (0 Group) and age 1 cod. It was suggested that further investigation of the spatial-temporal dynamics of juvenile cod together with a review of research vessel survey methods may provide insight into why catchability appears to be low and how this may be addressed in future surveys.

It was also suggested that the annual information collected on fish distribution from spatial fishing locations by gear be augmented with overlays from spatial environmental data and other existing ecosystem data for the 5Zj,m area. It was understood that this kind of information may provide insight into potential stock behaviour and survey results.

Despite the observed shift in age of first maturity from survey data down to age 2 cod, it was decided to continue expressing biomass estimates using the "ages 3+" measure as in the past until such time as the age of maturity is confirmed.

The discussion noted that the Canadian longline research survey completed its sixth year of operation and observations in 2001. Preparation and review for the inclusion of this survey in the assessment of this stock in 2002 is anticipated.

Outlook

While stock abundance estimates appear to be gradually increasing since the historical low value observed in 1995, there remains considerable concern over the apparent lack of year-over-year recruitment as observed from the surveys. Year-over-year stock growth since 1995 has been coming almost exclusively from body growth of cod. Fishing mortalities on these older age groups appear to be relatively low in the mixed cod-haddock fishery where cod catches are non-directed (by-catch from direct haddock trips).

TRAC discussed the use of alternative partial recruitment vectors for calculated the predicted catch in the current year (2001). The PRs considered were the flat-topped schedule (fully recruited stock at ages 4+) and the dome-shaped PR function with fully recruited F at age 3 only. TRAC agreed to present the extended projection information (e.g., risk analysis, Armstrong curves) for the more commonly used flat-topped function for this year.

The outlook for the 5Zj,m cod stock would be enhanced by referencing longer-term thresholds and targets, such as the threshold of 25,000t spawning stock biomass now commonly referred to indicate increased probability of improved recruitment. The establishment of limit thresholds on stock size is consistent with a precautionary approach to stock management that would help guide management alternatives. Biological rationale and evidence from longer-term historical data should accompany relevant target and limit thresholds.

The TRAC accepted the assessment for the eastern Georges Bank cod as presented.

Recommendations

Recommendations of 2000 TRAC

The chair directed attention to the recommendations made by TRAC in 2000 and how these had been addressed.

- It was recommended that an ageing workshop be held at the earliest opportunity, and definitely during the year 2000.

  In 2000, this recommendation repeated similar recommendations made in past TRACs relative to all Georges Bank stocks but with particular focus on cod. In 2001, it was again reported to TRAC that no cod ageing workshop had taken place, although there was a

workshop held in St. John's, Newfoundland during 28 – 30 November 2000 on yellowtail ageing.

- It is recommended that the partial recruitment (PR) be examined temporally, by gear to detect any shifts in the relative contribution by fleet sector.

  In 2001, TRAC examined alternative treatments for the partial recruitment vector in the VPA based on assumptions for calculating terminal Fs at oldest ages. The results indicated an overall gear propensity in recent years toward higher catchability of young cod and a reduced catchability on older cod more consistent with a dome-shaped PR function. TRAC considered the results and noted the evidence from industry that fleet dynamics in the mixed cod-haddock fishery (cod as by-catch) in recent years may be cause for a shift from the status quo flat-topped ages 4+ PR function to a dome with peak at age 3. For 2001, TRAC opted to continue with the status quo model with regard to the calculation of terminal Fs (average on ages 5-9) and for the 2002 yield projections. Gear shifts by fleet sector were not explicitly considered in the VPA or in the TRAC discussions.

- It is recommended that TAWG investigate the importance of data outliers and consider alternative methodologies for treating influential data.

  In 2000, this recommendation applied to all stocks. In 2001, overall, there was somewhat reduced evidence of influential data points and TRAC did not discuss this issue directly for the case of 5Zj,m cod.

- It is recommended that further analysis and review of the age of first maturity in this stock be undertaken in order to: (1) verify the occurrence of a decline in age of first maturity, and (2) hypothesize why this might be occurring and its implications on stock status.

  In 2000, it was noted that survey data, in particular samples taken from recent DFO Spring (February) surveys, were recording increasing proportions of age 2 cod as mature. In the 2001 survey, this trend continued to the extent that nearly every age 2 cod and older sample (over 95%) were spawning (mature) fish. Discussions at TRAC did not present formal hypotheses regarding these observations. The discussion did note: (1) that decreasing age at maturity, in general, was inconsistent with the apparent year-over-year increase estimated for the SSB for Georges Bank cod; and (2) that the February survey stations may be producing biased samples of only spawning stock (including only spawning two year olds) and not sufficiently sampling juvenile fish (at ages 1 and 2) outside the survey stations.

- It is recommended that ecosystem and environmental information available for the 5Zj,m area be provided to supplement spatial data on cod catch areas by gear.

  In 2001, environmental conditions for Georges Bank were presented and summarized as recommended. However, TRAC did not discuss the spatial-temporal pattern of environmental data (e.g., temperatures, salinity, presence of planktons) in connection to

the expected spatial-temporal dynamics of the cod stock and/or observed fishing patterns in 2000.

- It is recommended that data on stock condition factors for selected ages be included in the 2001 stock assessment.

  In 2000, this recommendation was meant to provide evidence of fish "plumpness" to help substantiate trends in other stock status observations such as the observed changes in percent mature fish at older ages. In 2001, no new stock condition factors for cod were presented.

- It is recommended that stock biomass long-term targets and lower limit biomass thresholds be established for this stock based on biological rationale.

  In 2001, stock biomass lower limit thresholds were discussed for cod adult biomass proxy measures (ages 3+ biomass) and the incidence of improved recruitment numbers at age 1 from the historical stock-recruitment function based on the 2001 VPA. It was stated that age 3+ cod biomass would need to reach at least 25,000t before improved recruitment could be expected. Longer-term stock biomass targets (beyond the 25,000 lower limit threshold) for cod based on a longer history of stock exploitation were not discussed for this stock.

- It is recommended that statistics on the relative proportions of the 5Zj,m cod stock biomass on the Canadian and American sides of the Hague Line be produced as part of future stock assessments.

  In 2001, a table of values for the relative proportions of cod biomass observed in the three annual NMFS and DFO surveys on either side of the Hague Line were presented in the cod SSR.

Recommendations of 2001 TRAC

- Recommended for the fourth consecutive year, an ageing workshop should be held at the earliest opportunity, and definitely during the year 2001.

- The TAWG examine the PR function temporally for 5Zj,m cod and determine an appropriate method for calculating the corresponding terminal F's in the event that a shift in the PR from the current flat-top model to a dome model be warranted in 2001; TAWG should also recalculate the value of F0.1 under any shift in the PR.

- The TAWG analyze the observed decline in age of first maturity in this stock to: (1) verify the occurrence of the decline, and (2) hypothesize why this might be occurring (i.e., as a stock affect, and/or an artifact of restricted survey observations from only spawning fish). It is also recommended that stock condition factors for selected ages be included in the 2002 stock assessment to supplement stock status indicators and to substantiate apparent decline in age of first maturity.

- Available spatial-temporal ecosystem and environmental information be matched with corresponding spatial-temporal data on juvenile and adult cod dynamics on and around Georges Bank to help make a better connection between available environmental data and stock assessment results.

- The TAWG establish: (1) estimates for long-term targets and (2) lower limit thresholds for Georges Bank cod stock biomass based on historical data and biological rationale.

- Statistics on the relative proportions of the 5Zj,m cod stock biomass on the Canadian and American sides of the Hague Line continue to be produced as part of future stock assessments.

GEORGES BANK (5Z) COD

Working Paper: O'Brien, L. 2001. Assessment of the Georges Bank Cod Stock for 2001. TRAC Working Paper 2001/01.

Rapporteur: L. Van Eeckhaute

Remit:

- Update resource status through 2000 and characterize the variability of estimates of stock size and fishing mortality rates
- Estimate fishing mortality rates for 2002 that would result in a range of interannual growth (e.g. 10%, 20%) of total stock biomass, for a range of probabilities from moderate to high, including 75% and 95%
- Report on progress against research recommendations made at the 2000 TRAC.

The Georges Bank cod assessment was presented by Loretta O'Brien. The comments below summarize the main points of the discussion that followed the presentation.

The Fishery

Two sources of removals in 2000 not taken into account in the catch include a possible underestimate of discards which could be as high as 10% (as observed from the at sea sampling) and the recreational fishery catch which represents 10% of the total commercial catch. The maximum discard rate used in the assessment and obtained from the Vessel Trip Report database was 1% so discards were not added into the catch. If these additional removals are primarily small fish the amount in numbers could be substantial and the F on younger ages could be higher than what was estimated. It was recommended to investigate incorporating recreational fishery removals in the catch at age.

Resource Status

Input was requested on the method used to estimate a total 5Z index for the 1993 and 1994 DFO spring surveys which did not cover the whole 5Z area and whether it is appropriate to incorporate the estimated indices into the assessment. Suggestions were to do a similar calculation for years when there is data and compare the results to what was observed as a check on the reliability of the method or estimate the index with a multiplicative model. Another option would be to present a range of impacts from possible distributions (imputation). A concern was expressed over the effect on the age/size structure with a suggestion to estimate the abundance of under 40cm and over 40cm fish independently.

It was suggested that the CPUE index up to 1993, after which many changes in the fishery and in the reporting method took place, be used in the calibration. It had previously been observed that this did not have much affect on the terminal year estimates so there would not be much value in including it.

An explanation for the change in partial recruitment which was observed in the terminal year was sought. The fishing mortality on age 3 increased in the terminal year while that on older fish had decreased, possibly, since 1994. Younger fish could have been more available since 1994 with the imposition of trip limits which forced the fishery to fish closer to shore rather than make the longer trips to the eastern part of the bank where larger cod are more prevalent. This posed problems in deciding on the PR to be used in projections since it is not desirable to increase the exploitation on younger ages. It was agreed to use the 1995 to 1999 average PR with the caveat that the F on younger ages may be higher.

It was noted that survey mean weights at age should be used for stock weights for the next assessment. This has proved problematic in the past due to the lack of fish in the survey resulting in poorly estimated weights.

Some discussion on the comparability between the biomass weighted F (F_{bw}) reference point calculated from an age-aggregated surplus production models and the fully recruited F from an age aggregated model, as is done in this assessment, and how it affects the perception of this stock occurred. The high F on age 3 which occurred in 2000 make the comparability of this reference point problematic. These issues are addressed in the section on reference points.

The TRAC accepted the Georges Bank cod assessment as presented.

Recommendations

- Maturity ogives for 5Z and 5Zjm cod should be reviewed and that differences be reconciled, if possible. (Reiterated from last TRAC meeting.)

- Investigate incorporating recreational fishery removals in the catch at age.

- Present a range of impacts from possible distributions (imputation) of interpolating the 1993 and 1994 DFO spring survey to all of 5Z and calculate the index taking into account differences in distribution by size (under 40 cm and over 40 cm).

- Use survey weights at age to estimate population biomass.

EASTERN GEORGES BANK (5Zjm) HADDOCK

Working paper: Van Eeckhaute, L., and S. Gavaris. 2001. Assessment of Haddock on Eastern Georges Bank. TRAC Working Paper 2001/05.

Rapporteur: Steven Correia

Remit

- Report on the status of the stocks, updating results for the latest information from fisheries and research surveys and characterize the uncertainty of estimates
- For a range of yield quotas in 2001, evaluate the consequences on exploitation rate in 2001 and on spawning stock biomass (or its proxy) in 2002.
- Estimate the probability that the 2001 fishing mortality rate would exceed $F_{0.1}$ and that the spawning stock biomass in 2002 would not achieve a 0%, 10% and 20% increase compared to 2001, for a range of yield quotas in 2001.
- Report on progress against research recommendations made at the 2000 TRAC.

The Eastern Georges Bank haddock assessment was presented by Lou Van Eeckhaute.

The Fishery

The issue of discards in the haddock fishery was discussed. The occurrence of high discarding rates has been episodic throughout the VPA time series, and discards have been included in the VPA when discarding rate has been high. Estimates of discards in the US fishery for recent years are low. Comparison of port and sea sample length frequencies in the Canadian fishery suggests that discards in 2000 were not problematic. In addition, data are currently unavailable for characterizing the length distribution of the discards in the US fishery. The TRAC recommended that a framework for addressing discard estimation (i.e., methods to examine discards problems) be discussed by the TAWG. This recommendation, carried over from last year's TRAC, was not examined this year, but discards do not appear to be a problem at this time. However, the discarding rate may increase as the 1998 year-class recruits to the fishery in 2001 and sublegal fish are discarded due to minimum size regulations.

Resource Status

The TRAC discussed mean weights at age relative to detecting density dependent influences on growth rates. Interpreting changes in the commercial weight at age is difficult because of

temporal and spatial changes in the fishery to minimize cod catches. The TRAC recommended evaluating the condition or plumpness at age for trends that might indicate changes in the health of the stock.

The NMFS Fall survey has more variability than other indices in the 5Zjm stock area. The index was strongly influenced by a couple of large tows combined with low sampling intensity on eastern Georges Bank. However, the low sampling intensity occurs because the survey was designed to sample a much broader area than 5Zjm. The current benchmark assessment did not weight the tuning indices because of the short Canadian time series. The time series are now long enough to explore iterative re-weighting of indices at the next benchmark assessment. The TRAC also recommended exploring the use of industry long-line survey as a tuning index in the next benchmark assessment.

Outlook

The estimate of the 2000 year class is based on two survey indices and the estimate has high uncertainty. However, the uncertainty of this year-class does not influence the projection of 3+ biomass in 2002.

The TRAC accepted the eastern Georges Bank haddock assessment as presented.

Recommendations

- The TAWG discuss a framework for addressing discard estimation (methods to examine discards problems).
- The "condition" or "plumpness at age" for haddock be evaluated for trends that might indicate changes in the health of the stock.
- The use of iterative re-weighting of tuning indices be examined for the next benchmark assessment.
- Variability in estimates of fishery-dependent catch rates be expressed.
- The use of industry based long line survey as a tuning index in the benchmark assessment be examined.
- The DFO spring survey's maturity stage observations to detect whether a warming trend in water temperature impacts the timing of haddock spawning be examined.

GEORGES BANK (5Z) HADDOCK

Working paper: Brown, R. 2001. Stock Assessment of Georges Bank Haddock, 1931 – 2000. TRAC Working Paper 2001/02.

Rapporteur: Steven Correia

Remit

- Update resource status through 2000 and characterize the variability of estimates of stock size and fishing mortality rates
- Estimate fishing mortality rates for 2002 that would result in a range of interannual growth (e.g. 10%, 20%) of total stock biomass, for a range of probabilities from moderate to high, including 75% and 95%
- Report on progress against research recommendations made at the 2000 TRAC.

The assessment was presented by Russell Brown.

The Fishery

The 1996 year-class is stronger in the Canadian fishery than the USA fishery but USA fishery has more older fish. In certain quarters, scrod and market samples come from different ports with different cull points. The 1996 year-class may be potentially under-represented in the USA catch at age. The USA sampling intensity that can not account for port differences in cull size in the scrod and market size. The TRAC recommended that sampling paired market category by trip. The current sampling intensity will not support stratifying by port, but sampling intensity will need to improve from current intensity. The presence of older fish in the USA catch may be a function of larger vessel size in the USA fleet which would allow more fishing on the larger fish residing in the deeper water.

The TRAC discussed the issue of discards in the haddock fishery. The occurrence of high discarding rates has been episodic throughout the VPA time-series, and discards have been included in the VPA when discarding rate has been high. Sensitivity analyses that remove discards from the assessment did not improve the assessment. Estimates of discards in the US fishery for recent years are low. Comparison of port samples, sea sample, and at sea boarding length frequencies in the Canadian fishery suggests that discards in 2000 were not problematic. Observer data have been examined, but data is sparse since 1989. In addition, data are currently unavailable for characterizing the length distribution of the discards in the US fishery. The TRAC recommended that a framework for addressing discard estimation (i.e., methods to examine discards problems) be discussed by the TAWG. This recommendation, carried over from last year's TRAC, was not examined this year, but discards do not appear to be a problem at this time. However, the discarding rate may increase as the 1998 year-class recruits to the fishery in 2001 and sublegal fish are discarded due to minimum size regulations.

Resource Status

The maturity ogives were updated. The TRAC discussed whether a trend toward earlier maturation is occurring in this stock. Although a trend towards earlier maturation was not readily discernible, a concern was raised about the possibility that a trend to earlier maturation was counterintuitive with a rebuilding stock. The TRAC noted that a higher rate of maturation at age 2 impacts the estimation of spawning stock biomass. This issue raised the concern about using spawning stock biomass as a management metric when estimates of maturity ogives are often imprecise and the effective contribution of young, first-time spawners to reproductive success may be less than older, repeat spawners. An examination of using 2+ or 3+ spawning stock biomass did not improve the stock and recruit relationship.

Preliminary information on transforming USA survey indices (delta and log transformed) to statistically account for rare large tows was presented. Further work will needed to develop software to transform Canadian survey indices and to evaluate the impact of transformed indices on the assessment. This should be considered in the next benchmark assessment. Preliminary results from a study on using iterative re-weighting of tuning indices using chi-weights from the residual sums of squares was reported. Although more work is needed, preliminary results suggest no difference in fishing mortality rate and slight improvement in spawning stock biomass. This work should continue and iterative re-weighting of tuning indices should be considered in the next benchmark assessment.

Outlook

The estimate of the 2000 year class is based on two survey indices and the estimate has high uncertainty. The uncertainty in the estimate of the 2000 year-class widens the probability distribution of projected spawning stock biomass in 2003. Both the 1998 and 1999 year-classes have been over-estimated in previous assessments, although this is may not represent a retrospective pattern because the previous estimates had high variation.

The TRAC accepted the 5Z Georges Bank haddock assessment as presented.

Recommendations

- An evaluation of iterative re-weighting of tuning indices be conducted in the next benchmark assessment.
- An evaluation of the use of the industry long-line survey as tuning indices in the next assessment be undertaken.
- The "condition" or "plumpness at age" for haddock be evaluated for trends that might indicate changes in the health of the stock.
- Rebuilding of east-west components of haddock in the benchmark be evaluated.

GEORGES BANK (5Zjmnh) YELLOWTAIL

Working Paper: Stone, H.H., C.M. Legault, S.X. Cadrin, S. Gavaris, J.D. Neilson, and P. Perley. 2001. Stock Assessment of Georges Bank (5Zjmnh) Yellowtail Flounder for 2001. TRAC Working Paper 2001/03.

Rapporteur: John Neilson

Remit:

- Report on the status of the stocks, updating results for the latest information from fisheries and research surveys and characterize the uncertainty of estimates
- For a range of yield quotas in 2001, evaluate the consequences on exploitation rate in 2001 and on spawning stock biomass (or its proxy) in 2002.
- Estimate the probability that the 2001 fishing mortality rate would exceed $F_{0.1}$ and that the spawning stock biomass in 2002 would not achieve a 0%, 10% and 20% increase compared to 2001, for a range of yield quotas in 2001.
- Estimate fishing mortality rates for 2002 that would result in a range of interannual growth (e.g. 10%, 20%) of total stock biomass, for a range of probabilities from moderate to high, including 75% and 95%
- Report on progress against research recommendations made at the 2000 TRAC.

Prior to discussion of the Working Paper, the Chairman requested clarification of the Bayesian analyses presented as an Appendix in the working paper. It was clarified that the main purpose of conducting the work was to provide confirmation of the ASPIC results in light of some of the recently identified problems with the surplus production model, and is provided for information only rather than for review by TRAC.

The 5Zjmnh yellowtail assessment was presented by H. Stone.

The Fishery

The location of the USA fishery was discussed. It was noted that the fishery is fairly localized and concentrates on the northern and southern edges of the Bank adjacent to Closed Area II. The fishery on the southern edge is the larger one at present.

The decline in the Canadian fishery CPUE was discussed. It was noted that while the series is not used directly in the population models, the 2000 values had declined substantially compared with 1999. No single cause for this was identified during discussions, but some potential contributing factors were identified including the presence of skates, changes in gear and a greater proportion of inexperienced fishermen. It was pointed out that during industry consultations, some industry participants with a history of involvement with the fishery reported a decline in fishery catch rates. Both DFO Science and industry were encouraged to make better use of the opportunity to review and synthesize fishery information. It was noted that given the well-circumscribed nature of the fishery, a complete summary of the year's fishing activity should be feasible, and could even be presented by industry at future meetings.

Sampling considerations were next discussed. The sharing of age-length keys was discussed at length, with questions raised as to whether it was appropriate to apply USA fall survey and commercial fishery age-length (ALK) keys to the Canadian fishery length samples (this procedure was necessitated by the absence of a Canadian age determination program, although this will likely be resolved in the coming year). In response to the concern, it was pointed out that the age material is collected on a length-stratified basis, then applied to the Canadian length-frequency samples. Further, possible spatial differences in length at age were not considered problematic since the Canadian and USA fisheries are located in fairly close proximity. The issue of sex disaggregation in the construction of the catch at age was also discussed, along with its possible ramifications. Canada uses a sex-specific approach to the construction of the catch at age, whereas the USA does not. While yellowtail flounder show sexually dimorphic growth and a sex-disaggregated approach would be preferred with adequate sampling, low sampling intensity is a serious consideration. It was noted that as the population age structure becomes older on average (as is anticipated with the continuing recovery of this resource), issues of properly reflecting differences in growth rate attributable to sex will become of more importance as differences in sexually dimorphic growth rate become more significant with age.

A document by G. Robert describing the spatial distribution of the Georges Bank scallop fishery in relation to the significant Canadian fishing grounds (the Yellowtail Hole) was introduced by Stephen Smith and discussed by the group. In general, it was shown that only a small fraction of scallop landings originated in the Yellowtail Hole. It was suggested that examining scallop fishing effort distributions might be a useful adjunct to the analysis. It was also noted that there is an initiative to have observer coverage of a portion of the scallop fishery to obtain reliable estimates of this source of mortality.

Resource Status

It was noted that the first year reported in the Canadian survey series is 1987, yet the survey started in 1986. This was related to a change in stratification in 1987. This change had minimal impact for the analyses of cod and haddock survey information, thus those assessments include 1986 whereas the yellowtail assessment does not.

Some problems in year labels of the residual plots (Fig. 21 and 22) were indicated and will be corrected in the research document.

There was considerable discussion of the retrospective patterns evident in the assessment. Significant retrospective patterns were observed for ages 5 and 6, with some participants noting that age 4 also shows a pattern. The possibility that the pattern at age 4 originates with the more pronounced patterns at older ages in the VPA was mentioned.

Additional details were requested for the Bayesian analyses and for the starting conditions for the ASPIC run. In particular, it was requested how the starting conditions for ASPIC differed from last year's assessment. This information was made available later in the meeting.

Clarification on the partial recruitment at age was sought, in particular the very high PR on age 2. The recommendation of the TAWG was to average the partial recruitment over the past four years.

The change in the fishing mortality trajectory on Fig. 27 compared with last year was noted. The change was thought to be related to the retrospective pattern in the analyses and the change in the definition of the target from age 4+ $F_{0.1}$ to age 3+ $F_{0.1}$. To aid comparison with last year's results, it was later determined that the age 4+ $F_{0.1}$ target should be used.

There was a comment that the trends in F and biomass derived from the surplus production model do not reflect population structure, rather they reflect aggregate biomass dynamics at all ages. Recent changes observed in partial recruitment may present problems for this type of model.

Outlook

Two projection results were given, reflecting the VPA and surplus production model results. It was noted that the Fs used in the projections were not really comparable, and this should be highlighted if both results are used.

The basis for considering each projection was discussed. There was a suggestion of calculating average recruitment and yield per recruit to ascertain if the level of harvest indicated by the surplus production approach is sustainable. Such an analyses was prepared and presented later in the meeting. It was further suggested that a comparison of current age structure to the long-term stable age distribution could be made. This prompted discussion of the need for a broader range of reference points. It was pointed out that while considerations such as age structure are not formally evaluated against some benchmark, they are routinely tabled and examined as part of the overall assessment process.

Additional data were tabled that met the USA management requirement for a multi-year projection. It was noted that the potential for further population growth was low with status quo exploitation rates. It was pointed out that the relevancy of incremental changes in biomass for resources such as yellowtail flounder which are considered to be rebuilt to historic levels of biomass may be less than is the case for resources that are depleted. Other indicators may be of more relevance, such as age structure as discussed above.

Additional results showing permutations of the 2000 and 2001 assessments were presented. Participants noted that initial estimates of biomass are highly variable. Implications for biomass trajectories were discussed. The unconstrained option with corrected landings data was adopted for the SSR.

A revised figure showing the exploitation rate trajectory relative to 4+ F0.1 was presented. A figure comparing current age structure to the stable age distribution and the long-term age structure was presented. It was noted that further rebuilding is required. It was further suggested that the figure be included in the SSR, possibly under Management Considerations.

Recommendations

Recommendations of 2000 TRAC

The Chairman directed the attention of the group to the research recommendations made at the 2000 TRAC. Progress on the required work was presented in the Working Paper, and is summarized below:

- It is recommended that USA data be characterized with age-length keys disaggregated by sex if feasible, e.g. by applying aggregated age-length keys to small fish and using disaggregated keys for larger fish.

  Sample size for USA landings continues to be too low to allow for sex specific alks.

- It is recommended that the TAWG and TRAC further evaluate biological reference points with particular reference to MSY, including other methods of estimating MSY.

  As this assessment was an update, and not a benchmark, further biological reference points were not evaluated. It is expected that the next benchmark assessment for this stock will address this recommendation.

- It is recommended that other biological attributes of the stock be included in future assessments, to help characterize stock status.

  No additional biological attributes of the stock were available for inclusion in this assessment. It is expected that the next benchmark assessment for this stock will address this recommendation.

Recommendations of 2001 TRAC

- Both DFO Science and industry be encouraged to make better use of the opportunity to review and synthesize fishery information. A complete summary of the year's fishing activity should be feasible.

- The next benchmark assessment for yellowtail flounder be conducted after the yellowtail flounder ageing program by DFO has been established, the results verified and used to age the Canadian data (from TAWG discussion)

REFERENCE POINTS

Working Paper: Correia, S. 2001. Sensitivity of Biomass Weighted Fishing Mortality Rates to Fluctuations in the Ratio of Pre-recruit Mean Biomass to Total Mean Biomass. TRAC Working Paper 2001/06.

Rapporteur: Rob Stephenson

Remit:

- For all stocks, evaluate estimates of all relevant biological reference points, their reliability and their potential use in devising harvest strategies and decision rules.

Presentation Highlights

The TAWG did not achieve as much as it had hoped on this issue, due to the workload for and priority of completing the assessments. Two presentations were made to the TRAC. The first was that of Correia (2001). This paper summarized a retrospective analysis of the use of biomass weighted fishing mortality in relation to fully recruited fishing mortality and Fmsy in 11 groundfish stocks. It showed how the use of biomass weighted fishing mortality confounds fully recruited F with recruitment and complicates the interpretation of management actions triggered by harvest control rules.

S. Gavaris summarized TAWG discussions on the development of reference points (see TAWG report in Appendix 8). Both the US Sustainable Fisheries Act and the Canada Oceans Act require a precautionary approach in which fishing mortality is kept below that associated with maximum sustainable yield. At present, harvest strategies and reference points have been developed independently in the two countries. The TAWG discussed the desirability of achieving consensus on reference points and harvest strategies, and has begun an investigation of a common approach for the three stocks of relevance to the TRAC.

Discussion

The TRAC discussed the problem of mixing reference points and metrics of stock status that are based on different models (surplus production vs. dynamic pool), and the problem of the need for short-term (year over year) vs. longer term (equilibrium) reference points and considerations. In this regard, the TRAC expressed caution in the use of biomass weighted Fs in management decisions (see TAWG report).

The TRAC encouraged the TAWG to continue to investigate the basis for a consistent approach to reference points and harvest strategies (see TAWG report). It is expected that there will be continued work on this topic, perhaps leading to an intersessional TRAC meeting.

Recommendations

- The TAWG continue to investigate the basis for a consistent approach by the USA and Canada to reference points and harvest strategies.

APPENDICES

Appendix 1. List of Participants

Participant	Affiliation/Address	Telephone	Fax	E-mail
Russell Brown	NOAA Fisheries, USA	(508) 495-2380	(508) 495-2393	Russell.brown@noaa.gov
Donald Clark	Marine Fish, DFO, Canada	(506) 529-5908	(506) 495-5862	Clarkd@mar.dfo-mpo.gc.ca
Steven Correia	Mass. Div. Mar. Fish, USA	(508) 563-1779	(508) 563-5482	Steven.correia@state.ma.us
Ron Cronk	NBDAFA, Canada	(506) 662-7026	(506) 662-7030	
Claude d'Entremont	Inshore Fisheries Ltd., Canada	(902) 762-2522	(902) 762-3464	Inshore@auracom.com
Jean-Guy d'Entremont	FRCC, Canada	(902) 762-2522	(902) 762-3464	Jean.guy@ns.sympatico.ca
Stratis Gavaris	Marine Fish, DFO, Canada	(506) 529-5912	(506) 529-5862	Gavariss@mar.dfo-mpo.gc.ca
Jon Hansen	Resource Management, DFO, Canada	(902) 426-9046	(902) 426-9683	Hansenj@mar.dfo-mpo.gc.ca
Bette Hatt	Marine Fish, DFO, Canada	(506) 529-5920	(506) 529-5862	Hattb@mar.dfo-mpo.gc.ca
Joe Hunt	Marine Fish, DFO, Canada	(506) 529-5893		Huntjj@mar.dfo-mpo.gc.ca
Marc Johnston	NBDAFA, Canada	(506) 755-4000	(506) 755-4001	Marc.johnston@gov.nb.ca
Dan Lane	Univ. of Ottawa, Canada	(613) 562-5800	(613) 562-5164	Dlane@uottawa.ca
Bob Mohn	Marine Fish, DFO, Canada	(902) 426-4592	(506) 426-1506	Mohnr@mar.dfo-mpo.gc.ca
Tim Nickerson	SFIFA, Canada	(902) 768-2535	(902) 768-2259	
Robert O'Boyle	RAP, DFO, Canada	(902) 426-3526	(902) 426-5435	Oboyler@mar.dfo-mpo.gc.ca
Loretta O'Brien	NEFSC, NMFS, USA	(508) 495-2273		Loretta.OBrien@noaa.gov
Michael O'Connor	National Sea Products, Canada	(902) 634-5200	(902) 634-4926	Oconnm@highlinerfoods.com
Fred Page	Ocean Sciences, DFO, Canada	(506) 529-5935	(506) 529-5862	Pagef@mar.dfo-mpo.gc.ca
Mika Rahikainen	Marine Fish, DFO, Canada	(506) 529-8854	(506) 529-5862	Rahikainenm@mar.dfo-mpo.gc.ca
Michael Schirripa	NWFSC, NMFS, USA	(541) 867-0196		Michael.Schirripa@noaa.gov
Mark Showell	Marine Fish, DFO, Canada	(902) 426-3501	(902) 426-1506	Showellm@mar.dfo-mpo.gc.ca
Kent Smedbol	Dalhousie University, Canada	(902) 494-2830		Ksmedbol@phys.ocean.dal.ca
Stephen Smith	Invertebrate Fisheries, DFO, Canada	(902) 426-3317	(902) 426-1862	Smithsj@mar.dfo-mpo.gc.ca
Mark Soboil	ENFE, Univ. Rhode Island, USA	(601) 874-4563		Msob6359@postoffice.uri.edu
Rob Stephenson	Marine Fish, DFO, Canada	(506) 529-8854	(506) 529-5862	Stephensonr@mar.dfo-mpo.gc.ca
Barbara Stevenson	Maine, USA	(207) 775-5450	(207) 773-9096	Bds02@sprynet.com
Heath Stone	Marine Fish, DFO, Canada	(506) 529-5880	(506) 529-5862	Stoneh@mar.dfo-mpo.gc.ca
Lou Van Eeckhaute	Marine Fish, DFO, Canada	(506) 529-5938	(506) 529-5862	Van-eeckhautel@mar.dfo-mpo.gc.ca
Evan Walters	SFIFA, Shelburne, Canada	(902) 637-3276	(902) 637-3270	SFIFA@klis.com

Appendix 2. Letter of Invitation

Maritimes Regional Advisory Process
Bedford Institute of Oceanography, P.O. Box 1006
Dartmouth, Nova Scotia, B2Y 4A2
Tel. (902) 426-3526 / Fax. (902) 426-5435
e-mail: oboyler@mar.dfo-mpo.gc.ca

30 March 2001

Distribution

Dear Participant:

You are cordially invited to attend the Spring 2001 meeting of the Transboundary Resources Assessment Committee (TRAC), to be held in St. Andrews, New Brunswick, Canada during 17-20 April 2001. This is the fourth meeting in a series initiated in 1998 to provide joint peer review of assessments for resources shared by both Canada and the USA. This year, the TRAC will consider update assessments for Georges Bank cod, haddock, and yellowtail flounder, which will be prepared by Canadian and USA members of the Transboundary Assessment Working Group in early April. As well, the meeting will consider the evaluations of biological reference points for these stocks. Results will be reported to the respective management agencies of both countries.

Terms of reference, a draft agenda, a list of invitees, and information on accommodations are attached. We have arranged for a block of rooms at the Algonquin Hotel in St. Andrews.

The meeting will be held in the Conference Centre, Biological Station, St. Andrews. If you need directions, check with the receptionist in the main building. We would like to begin the meeting promptly at 08:30 am, Tuesday, April 17th , so please plan accordingly.

Please let me know at your earliest convenience if you will be attending (902 426-7070 or myrav@mar.dfo-mpo.gc.ca). If you have any questions, feel free to contact me at (902-426-7070). I look forward to seeing you in St. Andrews.

Sincerely,

Original Signed by:

R.N. O'Boyle

Attachments (4)

cc: Michael Sissenwine
Michael Sinclair

Appendix 3. Meeting Remit

Oceanographic Overview

Provide an overview of ocean climate conditions on Georges Bank during 2000, in comparison to the historical record.

Stock Assessments

For the following resources:

Eastern Georges Bank Cod (5Zjm)
Eastern Georges Bank Haddock (5Zjm)
Georges Bank Yellowtail (5Zjmnh)

- Report on the status of the stocks, updating results for the latest information from fisheries and research surveys and characterize the uncertainty of estimates
- For a range of yield quotas in 2001, evaluate the consequences on exploitation rate in 2001 and on spawning stock biomass (or its proxy) in 2002.
- Estimate the probability that the 2001 fishing mortality rate would exceed $F_{0.1}$ and that the spawning stock biomass in 2002 would not achieve a 0%, 10% and 20% increase compared to 2001, for a range of yield quotas in 2001.
- Report on progress against research recommendations made at the 2000 TRAC.

For the following resources:

Georges Bank Cod (5Z)
Georges Bank Haddock (5Z)
Georges Bank Yellowtail (5Zjmnh)

- Update resource status through 2000 and characterize the variability of estimates of stock size and fishing mortality rates
- Estimate fishing mortality rates for 2002 that would result in a range of interannual growth (e.g. 10%, 20%) of total stock biomass, for a range of probabilities from moderate to high, including 75% and 95%
- Report on progress against research recommendations made at the 2000 TRAC.

Other business

- For all stocks, evaluate estimates of all relevant biological reference points, their reliability and their potential use in devising harvest strategies and decision rules.
- Discuss and adopt, if agreed, proposed revisions to the TRAC process
- Advise the Transboundary Assessment Working Group (TAWG) as to which stocks require benchmark assessments in spring 2002 and provide appropriate terms of reference.

Appendix 4. Meeting Schedule

17 April 2001 – Tuesday

08:30 – 09:00 Welcome and Introduction
09:00 – 09:30 Update on Ocean Climate (F. Page) of Georges Bank
09:30 – 10:00 Transboundary Assessment Working Group (TAWG) Report
10:00 – 12:30 Cod 5Zjm

12:30 – 13:30 Lunch

13:30 – 16:00 Cod 5Z
16:00 – 17:30 Haddock 5Zjm

18 April 2001 – Wednesday

08:30 – 09:30 Haddock 5Zjm (cont'd)
09:30 – 12:00 Haddock 5Z

12:00 – 13:00 Lunch

13:00 – 15:30 Yellowtail Flounder 5Z
15:30 – 17:00 Report Preparation

19 April 2001 – Thursday

08:30 – 12:00 Reference Points

12:00 – 13:00 Lunch

13:00 – 15:00 TRAC Process and Advice to TAWG
15:00 – 17:00 Report Preparation

20 April 2001 – Friday

08:30 – 12:00 Report Review

12:00 Adjournment

Appendix 5. List of Documents Tabled

Brown, R. 2001. Stock Assessment of Georges Bank Haddock, 1931 – 2000. TRAC Working Paper 2001/02.

Correia, S. 2001. Sensitivity of Biomass Weighted Fishing Mortality Rates to Fluctuations in the Ratio of Pre-recruit Mean Biomass to Total Mean Biomass. TRAC Working Paper 2001/06.

Hunt, J.J. and B. Hatt. 2001. Population Status of Eastern Georges Bank Cod (Unit Areas 5Zjm) for 1978 – 2001. TRAC Working Paper 2001/04.

O'Brien, L. 2001. Assessment of the Georges Bank Cod Stock for 2001. TRAC Working Paper 2001/01.

Page, F.H., R. Losier, K. Drinkwater, B. Petrie, G. Harrison and D. Sameoto. 2001. Overview of Physical and Biological Oceanographic Conditions on Georges Bank. TRAC Working Paper.

Stone, H.H., C.M. Legault, S.X. Cadrin, S. Gavaris, J.D. Neilson, and P. Perley. 2001. Stock Assessment of Georges Bank (5Zjmnh) Yellowtail Flounder for 2001. TRAC Working Paper 2001/03.

Van Eeckhaute, L. and S. Gavaris. 2001. Assessment of Haddock on Eastern Georges Bank. TRAC Working Paper 2001/05.

Appendix 6. List of Recommendations

Eastern Georges Bank (5Zjm) Cod

- Recommended for the fourth consecutive year, an ageing workshop should be held at the earliest opportunity, and definitely during the year 2001.

- The TAWG examine the PR function temporally for 5Zj,m cod and determine an appropriate method for calculating the corresponding terminal F's in the event that a shift in the PR from the current flat-top model to a dome model be warranted in 2001; TAWG should also recalculate the value of F0.1 under any shift in the PR.

- The TAWG analyze the observed decline in age of first maturity in this stock to: (1) verify the occurrence of the decline, and (2) hypothesize why this might be occurring (i.e., as a stock affect, and/or an artifact of restricted survey observations from only spawning fish). It is also recommended that stock condition factors for selected ages be included in the 2002 stock assessment to supplement stock status indicators and to substantiate apparent decline in age of first maturity.

- Available spatial-temporal ecosystem and environmental information be matched with corresponding spatial-temporal data on juvenile and adult cod dynamics on and around Georges Bank to help make a better connection between available environmental data and stock assessment results.

- The TAWG establish: (1) estimates for long-term targets and (2) lower limit thresholds for Georges Bank cod stock biomass based on historical data and biological rationale.

- Statistics on the relative proportions of the 5Zj,m cod stock biomass on the Canadian and American sides of the Hague Line continue to be produced as part of future stock assessments.

Georges Bank (5Z) Cod

- Maturity ogives for 5Z and 5Zjm cod should be reviewed and that differences be reconciled, if possible. (Reiterated from last TRAC meeting.)

- Investigate incorporating recreational fishery removals in the catch at age.

- Present a range of impacts from possible distributions (imputation) of interpolating the 1993 and 1994 DFO spring survey to all of 5Z and calculate the index taking into account differences in distribution by size (under 40 cm and over 40 cm).

- Use survey weights at age to estimate population biomass.

Eastern Georges Bank (5Zjm) Haddock

- The TAWG discuss a framework for addressing discard estimation (methods to examine discards problems).
- The "condition" or "plumpness at age" for haddock be evaluated for trends that might indicate changes in the health of the stock.
- The use of iterative re-weighting of tuning indices be examined for the next benchmark assessment.
- Variability in estimates of fishery-dependent catch rates be expressed.
- The use of industry based long line survey as a tuning index in the benchmark assessment be examined.
- The DFO spring survey's maturity stage observations to detect whether a warming trend in water temperature impacts the timing of haddock spawning be examined.

Georges Bank (5Z) Haddock

- An evaluation of iterative re-weighting of tuning indices be conducted in the next benchmark assessment.
- An evaluation of the use of the industry long-line survey as tuning indices in the next assessment be undertaken.
- The "condition" or "plumpness at age" for haddock be evaluated for trends that might indicate changes in the health of the stock.
- Rebuilding of east-west components of haddock in the benchmark be evaluated.

Georges Bank (5Zjmnh) Yellowtail

- Both DFO Science and industry be encouraged to make better use of the opportunity to review and synthesize fishery information. A complete summary of the year's fishing activity should be feasible.
- The next benchmark assessment for yellowtail flounder be conducted after the yellowtail flounder ageing program by DFO has been established, the results verified and used to age the Canadian data (from TAWG discussion)

Reference Points

- The TAWG continue to investigate the basis for a consistent approach by the USA and Canada to reference points and harvest strategies.

Appendix 7. Minutes of Yarmouth 28 March 2001 Canadian Industry Consultations

(NOTE: The representatives from the SWFRA who attended the meeting did not have an opportunity to review and comment on the accuracy of the recorded minutes.)

General Comments

- Participation was lower, in part because fishermen were out fishing to take advantage of good weather
- S. Gavaris solicited comments for how to enhance participation; R. Walkins suggested paying a fee to fishermen for attending meetings; D. Grady suggested that managers and decision makers need a change of attitude and need to be persuaded to listen fishermen's views and knowledge

5Zjm Haddock

- L. Van Eeckhaute presented an update of fisheries and survey information
- The poor state of the resource was attributed, by D. Grady, to the devastating effects of draggers on the habitat and on the inadequate surveys conducted by DFO which did not give a true reflection of the state of affairs
- S. Gavaris noted that the DFO survey sampling intensity on Georges Bank was among the highest on the east coast and that we had the benefit of two additional surveys conducted by NMFS, USA; the assessment of stock status includes an evaluation of the uncertainties
- F. Sears observed that the bubble plots representing the catch at age showed bigger bubbles in earlier years indicating that the present stock status was worse; S. Gavaris replied that lower catches now reflect more restrictive management measures and it is necessary to compare bubble plots for the population, not the catch, to make an interpretation about stock status
- F. Sears considered that haddock were depleted though conditions were better on Georges Bank than other areas and some improvement from previous years was noted

5Zjm Cod

- J. Hunt presented an update of fisheries and survey information
- D. Grady attributed the low recruitment to overfishing and habitat destruction by draggers and expressed concern that corrective action was not taken
- J. Hunt indicated that the concerns regarding low abundance and recruitment had been conveyed for some years now and S. Gavaris added that the cod quota had been reduced from 5,000t to 1,000t in 1995
- B. Giroux noted that many cod stocks were experiencing recruitment failure
- J. Hunt commented that the high proportion of younger/smaller fish and fewer older/larger cod in the fishery catch was puzzling considering that larger cod were observed during the survey, although not as abundant as in past years; he asked if fishing practices had changed
- F. Sears noted any fisherman fishing Georges Bank is targeting large cod but the older/larger fish were not there any more and had been overfished, though the cod abundance on Georges Bank was higher than in Div. 4X; J. Hunt will examine the information from the longline survey to determine if larger/older cod were more prevalent in that survey

- F. Sears also commented that the low cod quotas were resulting in discarding and high-grading even though fishermen were moving away from cod areas; others noted that the dominance of young fish in the catch was not consistent with high-grading; S. Gavaris indicated that the observer coverage for the Georges Bank fishery, though not complete for all sectors, was amongst the highest
- D. Grady asked if DFO Science would take the responsibility of recommending a moratorium; F. Sears added that fishermen are worried that if something is not done, the fish won't come back; S. Gavaris replied that the purpose of this meeting was to review the interpretation of fishery and survey observations but further, the role of DFO Science was to determine the state of the resources and to quantify the consequences of alternative management actions, not to dictate actions

5Zhjmn Yellowtail

- H. Stone presented an update of fisheries and survey information
- C. d'Entremont noted several observations; the amount of females, which are larger, in the catch did not increase during the latter part of the year as in past years; some boats fished larger mesh in 2000; some vessels may have moved off the yellowtail hotspots in 2000 in an attempt to avoid catching skate; yield was lower in 2000
- H. Stone replied that small males dominated the catch even in the latter months of the fishery and the lower yield may be associated with this; he will compare the length weight relation by sex
- E. d'Entremont expressed concern that catch rates were lower in 2000 and noted that boats reverted to flounder foot gear in order to get acceptable catch rates; he indicated that larger mesh was necessary to reduce the capture of small yellowtail; he is concerned that there was no let up in activity in the Yellowtail Hole with the higher quota; there were some bigger fish west of the Hole; H. Stone indicated that this may be consistent with localized exploitation of a sedentary population and the recent tagging results confirmed that yellowtail show limited movement
- C. d'Entremont indicated that they would like to do mesh selection studies and that they may want to consider nets with both square and diamond panels, positioned strategically to improve selection in mixed yellowtail/haddock areas

Participants

Name	Affiliation	e-mail or Tel. #
Claude d'Entremont	Inshore Fisheries Ltd.	inshore@auracom.com
Arnold J. Muise	NS Dept. of Agri. & Fish.	muiseaj@gov.ns.ca
Brian Giroux	SFMGFA	SFmobile@fox.nstn.ca
Mike Walkins	fisherman	
Ronald Walkins	SWFRA	FAX: (902)745-2632
Don Grady	SWFRA	(902) 434-8815
Fred Sears	SWFRA	(902) 434-8815
Marc Johnston	NBDAFA	Marc.Johnston@gov.nb.ca
Jamie Lent	FSRS	jlent@auracom.com
Susan Arsenault	SFMGFA	sue-rejean@ns.sympatico.ca
Eric d'Entremont	fisherman	(902) 762-2558
Gilbert Donaldson	DFO Science	DonaldsonG@dfo-mpo.gc.ca
Heath Stone	DFO Science	StoneH@mar.dfo-mpo.gc.ca
Bette Hatt	DFO Science	HattB@mar.dfo-mpo.gc.ca
Joseph Hunt	DFO Science	HuntJJ@mar.dfo-mpo.gc.ca
Lou Van Eeckhaute	DFO Science	Van-EckhauteL@mar.dfo-mpo.gc.ca
Stratis Gavaris	DFO Science	GavarisS@mar.dfo-mpo.gc.ca

Appendix 8. Report of the TAWG, 16 – 18 March 2001, Woods Hole Laboratory, Woods Hole, Ma.

Sampling for the USA fishery improved overall in 2000, however, some problems persisted. Specifically:

- For cod, very few samples in the large market category compromises the ability to characterize catch at age of older fish and will affect population estimates for older cod.
- for haddock, low sampling intensity of only 1 or 2 samples within a market category-quarter cell compromises the ability to characterize catch at age and will have an impact on the assessment results. Matched culled samples or balanced sampling in relation to landed tonnage is required to overcome divergent culling practices among ports and for 2000, the catch at length displays bi-modality with a saddle point at about the average length of the dominant year-class.
- for yellowtail flounder, although large numbers of yellowtail flounder samples were taken overall (for four stocks combined) the spatial distribution of samples was uneven and Georges Bank trips were not sampled adequately.

Provisional USA commercial landings data are still being used for 1994-2000 and the 2000 VTR data, used for pro-ration of landings, was unaudited.

Fourth quarter USA sea sampling data was not available in time for the yellowtail assessment, and no sea sample age data were available.

Lack of sufficient discard data in the USA scallop fishery for yellowtail flounder could be supplemented by sampling of length frequency of discarded catch on trips allowed to fish in the closed areas.

Agreement between age readers for cod and haddock continues to be high, however, the TAWG supports an ageing workshop for DFO and NEFSC age readers.

Age interpretation of yellowtail structures collected from the DFO survey and the Canadian fishery were not available for any year. Age-length keys from NMFS surveys and USA fishery were substituted to derive age composition. Yellowtail grow very slowly beyond about 30cm making substitution of age-length keys from other sources a questionable practice. Also, the use of iterative methods employing length-at-age templates will perform poorly when most of the fish in the population have reached the slow growth phase. The use of iterative methods to derive age composition for the DFO 2001 survey was rejected and this index was not used in the base assessment analysis.

An age interpretation program for yellowtail flounder is being implemented by DFO. It is recommended to align the timing of the next benchmark assessment of yellowtail flounder with the incorporation of the age data analysis for DFO surveys and Canadian fisheries.

Implementation of the bias corrected percentile method in NMFS FACT software and the use of survey weights to calculate population biomass would make DFO and NMFS analyses

more compatible and assessment results more easily compared. In addition, there are subtle differences in the results of the APL and Fortran versions of ADAPT that need to be resolved.

Biomass (age 1+) weighted F (F_{bw}) is sensitive to fluctuations in the abundance of pre-recruit fish. Due to this, interpretation of F_{bw} is complicated and the trends in F_{bw} are often counter-intuitive when compared to fully recruited F. Re-estimation of F_{bw} based on exploitable biomass would more consistent over time. Calculation of F_{bw} is carried out in order to compare against F reference points derived from age-aggregated surplus production models. F_{bw} based on exploitable biomass would not be directly comparable to the surplus production reference points. Age based production models may be an alternative analysis to explore to obtain reference points.

For estimation of reference points, a three tier approach could be used, depending on data quality - 1) if age data is available, use age based production analysis employing either a parametric or non-parametric stock-recruit relationship or 2) when stock-recruit data are unavailable, unreliable or do not support any meaningful relationship, use yield per recruit analysis, and 3) otherwise, use of a stock production model could be explored.

Caution should be used in comparing F estimates of current status derived from age structured analyses against F reference points derived from age-aggregated surplus production models. It is preferable to use the same type of model to follow through to projections and to risk analyses against reference points.

The TAWG re-iterated that 10-year projections were most useful for explorations of alternative harvest strategies in terms of relative performance. The utility of long term projections for establishing explicit annual measures to achieve rebuilding is considered less certain. Based on an analysis of 39 stocks, Patterson et al. (2000) concluded that probability statements about medium term forecasts should not be taken as representing the actual probabilities of eventual outcomes.

Patterson, K.R, R.M. Cook, C.D. Darby, S. Gavaris , B. Mesnil, A.E. Punt, V.R. Restrepo, D.W. Skagen, G. Stefansson, and M. Smith. 2000. Validating three methods for making probability statements in fisheries forecasts. ICES Cm 2000/V:06, 25 p